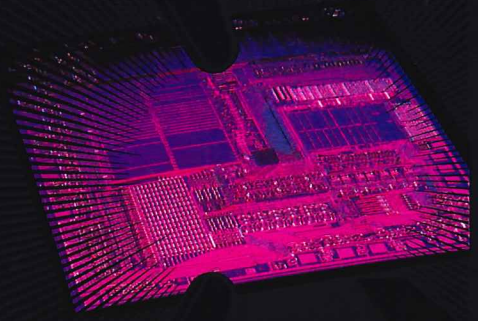
INTERSIL

PRODUCT GUIDE

Excellence in Signal Processing and Control Integrated Circuits



GE INTERSIL
PRODUCT GUIDE

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Key Products

ICL7115 14-bit, 40μs A/D: Using GE Intersil's proprietary on-board EPROM error correction techniques, the monolithic ICL7115 achieves full 14-bit integral linearity and resolution while dissipating only 60mW. The ICL7115 easily interfaces to either hardwired systems, 16-bit buses, 8-bit buses using 6 control signals (WR, RD, CS, EOC, 8/16 BUS SELect, and A0) and 15 bits (D0–D14 and overrange).

ICL7134 14-bit D/A: Also using GE Intersil's proprietary on-board EPROM error correction techniques, the ICL7134 is available in 12-, 13-, and 14-bit integral linearity grades, in both bipolar and unipolar versions. The ICL7134 interfaces to either 8- or 16-bit data buses using on-board double buffered latches.

ICL7650 and ICL7652 Precision Op Amps: Using an innovative auto-zeroing technique, the ICL7650/52 achieve the outstanding combination of $<5\mu V$ maximum offset and a maximum offset tempco of only $0.01\mu V/°C$.

IGC10000 and IGC20000 Gate Array Families: With extensive software and development support, GE-Intersil's broad range of gate arrays is suitable for either cost/space reduction redesigns, or complex combined analog and digital circuits for new products.

ICL7660 Voltage Inverter: A monolithic charge pump DC-DC voltage converter, the ICL7660 will convert a positive voltage in the range of 1.6 to 10V to a negative voltage in the −1.6 to −10V range with a no load voltage conversion efficiency of >99% and a power conversion efficiency of 98% @ 2mA output. Supplying up to 20mA, the ICL7660 is a cost effective source of medium power negative supplies for analog circuitry in systems with only +5V power.

ICL7611 CMOS Op Amp Family: The ICL7611 op amp family combines selectable quiescent current (down to 10μA), low input bias currents (1pA typical), with a wide supply range (±1.0V to ±8V) and rail-to-rail output swing in a cost effective family of op amps that includes singles, duals, triples and quads; all in industry standard pinouts. The family also includes an extended common-mode range ICL7612 whose CMVR includes both supply rails and input protected versions which can withstand up to ±200V inputs without any external protection circuitry.

ICL7555/7556 CMOS Timers: These CMOS versions of the popular 555 and 556 timers combine higher speed and lower power dissipation, while the lower input currents of CMOS ICL7555/7556 allow the use of higher impedance timing circuits for longer time delays. The ICL7555 does not draw large supply transients during output switching, unlike the bipolar 555 timer, whose supply current transients often interfere with sensitive analog circuits even with extensive bypassing and decoupling.

IH5108 Fault-Protected Multiplexer Family: The only true fault-protected MUXs available, the IH5108 family can withstand up to ±25V inputs with or without ±15V power to the MUX. Unlike other MUXs which claim to be fault-protected, the IH5108 avoids crosstalk between channels even under overvoltage conditions. Furthermore, the IH5108 limits the output voltage to ±13.5V even under fault conditions, thereby protecting sensitive (and expensive) A/D and signal conditioning circuitry connected to the output of the MUX (Fall 1984).

ICM7280/81/83 Dot Matrix LCD Drivers: An excellent choice for driving large dot matrix alphanumeric LCD displays. The ICM7280/83 controller contains a high-speed microprocessor interface, character generator, row drivers, and control circuitry for an 80-character dot matrix display. A 115 character font with multiple options, 4 user programmable characters and on-board scrolling make the ICM7280 a powerful LCD single-chip controller. The ICM7281 column LCD driver features 40 high voltage low resistance drivers capable of driving 1.5V threshold LCDs from a single 5V supply (Available summer 1984).

ICL7663 and ICL7664 CMOS Regulators: The ICL7663 voltage regulator draws only 4μA quiescent current, yet can deliver up to 40mA of output current with a low V_{IN}–V_{OUT} differential less than 1V. At very low current levels, the V_{IN}–V_{OUT} differential is only a few millivolts since the series pass element is a P-channel MOSFET. Designed for battery operated equipment, the ICL7663 will operate from 1.6V to 16V input, current limiting using external sense resistors, and output shutdown using an external logic signal. The ICL7664 is the negative voltage output equivalent of the positive output voltage ICL7663.

ICL7665 Micropower Over/Undervoltage Detector: Drawing only 3μA quiescent current, the ICL7665 is a dual channel over/undervoltage detector which combines a low current 1.3V bandgap reference, two comparators, and hysteresis and open drain outputs on a single monolithic IC. The ICL7665 excels at low battery detection, CMOS memory battery backup switchover, and μP power-up reset and power fail applications.

ICM7231/32/33/34 Triplexed LCD Display Driver Family: These low power CMOS LCD drivers utilize 3-way multiplexing to economically provide multidigit display drive capability in standard 40-pin DIPs. Microprocessor compatible using a RAM-like interface, the ICM7233 drives 4 characters of 18-segment alphanumeric LCDs. The ICM7234 drives 5 alphanumeric LCD characters while providing a serial interface. The ICM7231 drives 8 digits of 7 segments each, plus individual control of 16 annunciators.

ICL8038 Waveform Generator: Generates simultaneous sine, square and triangle waves with low distortion. Using only a few external components, the ICL8038 has a wide frequency range of 0.001Hz to 300kHz.

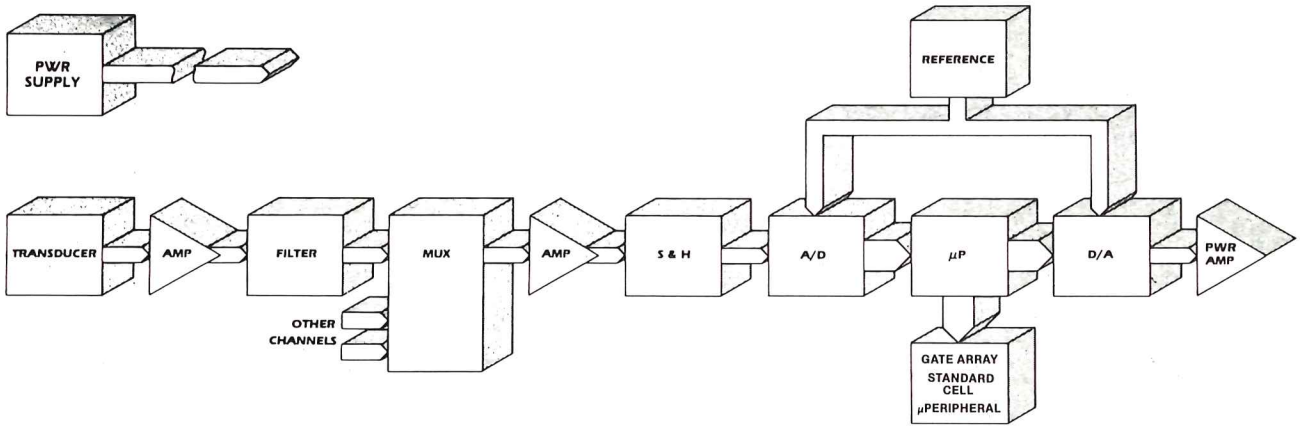
ICL7106 3½-Digit Panel Meter Family: The simplest, lowest cost method of making a 3½-digit voltmeter, the ICL7106 family will directly drive either LCD or LED displays, has true differential input and reference, low power dissipation of less than 1mW, and less than 1pA input current.

ICL7109 12-bit + Sign μP Compatible Integrating A/D: Ideal for interfacing slowly changing analog signals to a μP. The inherent noise rejection capabilities of the integrating A/D ease the problem of interfacing low level signals such as thermocouples, strain gauges and millivolt level signals. The ICL7109 also has an on-board UART interface, and the ICL7109 and IM6403 UART form a simple 2-chip remote data acquisition system.

ICM7217 4-Digit Up/Down Counter: The ICM7217 counter is ideal for simple count-and-control systems, with a presettable counter, on-board comparison register, up/down control input, equals and zero outputs and on-board 4-digit LED display driver. Typical applications include cycle timing, batch counting, presettable up/down counter, and over/under speed monitoring.

ICM7224 4½-Digit Counter Family: With a quiescent current of only 10μA, the ICM7224 is ideal for battery powered counters. The ICM7224 includes a 4½-digit counter, a storage latch and an on-board 4½-digit display driver. Other family members can drive LEDs (ICM7225) and Vacuum Fluorescents (ICM7236).

GE INTERSIL DEMONSTRATES ITS INNOVATIVE APPROACH IN SIGNAL PROCESSING AND CONTROL INTEGRATED CIRCUITS.



Engineering Solutions on a Chip
From GE Intersil

Integrating Analog-to-Digital Converters for Display — Maximum Electrical Specification at 25°C unless otherwise noted.

	ICL7106/ICL7116	ICL7137 ICL7107/ICL7117	ICL7136	ICL7135	ICL7129
Resolution	±3½-Digit	±3½-Digit	±3½-Digit	±4½-Digit	±4½-Digit
Accuracy					
Nonlinearity	±1 count	±1 count	±1 count	±1 count	±1 count
Zero Input Reading	±0.000	±0.000	±0.000	±0.0000	±0.0000
Ratiometric Reading	±1.000	±1.000	±1.000	±1.0000	±1.0000
$V_{IN}=V_{REF}$	±1 count	±1 count	±1 count	±1 count	±1 count
Rollover Error	±1 count	±1 count	±1 count	±1 count	±3 count
Stability					
Offset vs. Temp.	1μV/°C	1μV/°C	1μV/°C	1μV/°C	1μV/°C
Gain vs. Temp.	5ppm/°C	5ppm/°C	5ppm/°C	5ppm/°C	5ppm/°C
Conversion Time	0.1 to 15 conv/sec	0.1 to 15 conv/sec	0.1 to 3 conv/sec	0.1 to 15 conv/sec	0.1 to 6 conv/sec
Analog Input					
Voltage Range	±200mV to ±2V	±200mV to ±2V	±200mV to ±2V	±2V	±200mV to ±2V
Impedance	$10^{12}\Omega$	$10^{12}\Omega$	$10^{12}\Omega$	$10^{12}\Omega$	$10^{12}\Omega$
Leakage Current	2pA	3pA	2pA	3pA	10pA
Noise (peak-to-peak)	15μV typ.	15μV typ.	15μV typ.	15μV typ.	7μV typ.
Digital Input	Display Hold (7116)	Display Hold (7117)		Run/Hold	Range, hold, decimal points, continuity
Digital Outputs					
Format	Direct 7-segment LCD display	Direct 7-segment LED display Common Anode	Direct 7-segment LCD display	Multiplex BCD with strobe, under & overrange, polarity	Multiplexed 7-segment LCD display, low battery, overrange, continuity
Logic Level	AC: 4.5V down from V+	DTL/TTL/CMOS	AC: 4.5V down from V+	TTL/CMOS	AC: 5.5V down from V+
Power Supply					
Voltage	+9V	±5V	+9V	±5V	+9V
Current	1.8mA	1.8mA (7107/7117), 0.2mA (7137)	100μA	1.8mA	1.8mA
Package	40-pin DIP	40-pin DIP	40-pin DIP	28-pin DIP	40-pin DIP

Integrating Analog-to-Digital Converters for Data Acquisition

TYPE	SINGLE-CHIP	TWO CHIP SYSTEM	
	ICL7109	ICL8052A/8068 ICL7104-14	ICL8052A/8068 ICL7104-16
Resolution	±12-bit binary	±14-bit	±16-bit
Accuracy	±1 count	±1 count	±1 count
Microprocessor Compatible	Yes	Yes	Yes
Output	Programmable (Notes 1 & 2)	Programmable (Notes 1 & 3)	Programmable (Notes 1 & 3)
Control Lines	(Note 4)	(Note 4)	(Note 4)
Conversion Time	10ms	80ms	330ms
UART Compatible	Yes	Yes	Yes
Noise (Typical)	15μV	2μV (8068)	2μV (8068)
Input Current	10pA	30pA (8052)	30pA (8052)
Input Voltage Range	±400mV to ±4.1V	±100mV to ±4V	±200mV to ±4V

Notes:
1. Latched parallel 3-state binary.
2. Controlled two 8-bit bytes.
3. Controlled two 8-bit bytes for ICL7104-14, three 8-bit bytes for ICL7104-16.
4. Run/Hold, Busy, Byte Enables, Mode, Load, Send Enable, Overrange.

Successive Approximation Analog-to-Digital Converters for Data Acquisition

	ADC0801-4	ICL7115 J/K/L
Resolution	8-Bit	14-Bit
Accuracy	±¼/½/½/1 LSB	0.01/0.006/0.003%
Microprocessor Compatible	Yes	Yes
Output	Programmable 1. Latched parallel 3-state binary 2. One 8-bit byte	Programmable 1. Latched parallel 3-state binary 2. Controlled two 8-bit bytes, or one 15-bit word
Control Lines	CS, RD, WR	CS, RD, WR, A0
Conversion Time	100μs	40μs
UART Compatible	Yes	Yes
Input Voltage Range	0-5V	0-5V

Digital-to-Analog Converters — Maximum Electrical Specification at 25°C unless otherwise noted.

	AD7523	AD7533	AD7520 (7530)	AD7521 (7531) (7533)	AD7541	ICL7134U/B
Resolution	8-Bit	10-Bit	10-Bit	12-Bit	12-Bit	14-Bit
Accuracy	J/K/L	J/K/L	J/K/L	J/K/L	J/K/L	J/K/L
Linearity	0.2%/0.1%/0.05%	0.2%/0.1%/0.05%	0.2%/0.1%/0.05%	0.2%/0.1%/0.05%	0.2%/0.01%/0.05%	0.01/0.006/0.003%
Zero Offset	50nA	50nA	200nA (300nA)	200nA (300nA)	50nA	10nA
Gain Error	1.5% max.	1.4%	0.3% typ.	0.3% typ.	0.3%	0.006%
Stability						
Gain vs. Temp.	10ppm/°C	10ppm/°C typ.	10ppm/°C	10ppm/°C	10ppm/°C typ.	5ppm/°C typ.
Linearity vs. Temp.	2ppm/°C	2ppm/°C typ.	2ppm/°C	2ppm/°C	2ppm/°C typ.	1ppm/°C typ.
Settling Time						
to ±0.05% FS	150ns	600ns	500ns typ.	500ns typ.	1μs	0.9μs typ.
Input Code	DTL/TTL/CMOS	DTL/TTL/CMOS	DTL/TTL/CMOS	DTL/TTL/CMOS	DTL/TTL/CMOS	DTL/TTL/CMOS
Logic Compatibility Option	Binary, offset binary	Binary, offset binary	Binary, offset binary	Binary, offset binary	Binary, offset binary	Double buffered binary (U); 2's complement (B)
Power Supply						
Voltage	+5 to +16V	+5 to +15V	+5 to +15V	+5 to +15V	+5 to +16V	+3.5 to +6.0V
Current	100μA	2mA	2mA	2mA	2mA	3mA
Package	16-pin DIP	16-pin DIP	16-pin DIP	18-pin DIP	18-pin DIP	28-pin DIP

Quad Current Switches ICL8018/8019/8020

High-speed precision current switches for use in current summing D/A converters. Can be purchased individually or in matched sets with accuracies of 0.01% (ICL8018), 0.1% (ICL8019), or 1.0% (ICL8020).

Sample and Hold

TYPE	V_{analog} (V_{P-P})	t_{acq} (μs)	V_{inject} (mV)	V_{OS} (mV)	DRIFT RATE (mV/sec)
IH5110	±7.5	6	5	40	5
IH5111	±10	6	5	40	5
IH5112	±7.5	6	5	10	5
IH5113	±10	6	5	10	5
IH5114	±7.5	6	5	5	5
IH5115	±10	6	5	5	5

Operational Amplifiers — CMOS

Wide operating voltage range ±1.0V to ±8V; high input impedance—$10^{12}\Omega$; programmable power consumption — as low as 20μW; input current lower than BIFETs — typ. 1pA; available as singles, duals, triples, and quads; output voltage swings to within millivolts of V– to V+; ideal for use in portable instruments, meter amplifiers, telephone headsets, medical instruments, hearing aid/microphone amplifiers, and high impedance buffers.

TYPE	DESCRIPTION	COMPENSATION	OFFSET NULL	V_{OS} SELECTION (mV)	I_{OS} (pA)	I_B (pA)	PACKAGE
7611	Single, Selectable I_Q	Internal	Yes	2, 5, 15	0.5	1	P, T
7612	Single, Selectable I_Q Extended CMVR	Internal	Yes	2, 5, 15	0.5	1	P, T
7613	Single, Selectable I_Q Input Protected to ±200V	Internal	Yes	2, 5, 15	0.5	1	P, T
7614	Single, Fixed I_Q	External	Yes	2, 5, 15	0.5	1	P, T
7615	Single, Fixed I_Q Input Protected	External	Yes	2, 5, 15	0.5	1	P, T
7621	Dual, Fixed I_Q	Internal	No	2, 5, 15	0.5	1	P, T
7622	Dual, Fixed I_Q	Internal	Yes	2, 5, 15	0.5	1	P, J
7631	Triple, Selectable I_Q	Internal	No	5, 10, 20	0.5	1	P, J
7632	Triple, Selectable I_Q	None	No	5, 10, 20	0.5	1	P, J
7641	Quad, Fixed I_Q	Internal	No	5, 10, 20	0.5	1	P, J
7642	Quad, Fixed I_Q	Internal	No	5, 10, 20	0.5	1	P, J

Operational Amplifiers — Precision/Ultra Low V_{OS}

These Precision/Ultra-low V_{OS} amplifiers use GE Intersil's unique autozeroing techniques to achieve <1μV offset at a reasonable cost. These amplifiers are ideal for low level single amplification in such applications as thermocouple and strain gauge preamps, and in other circuits requiring a combination of low V_{OS}, low V_{OS} tempco, low bias current, and very high gain.

Extremely low input offset voltage — 1μV over temperature range; low DC input bias current — 10pA; extremely high gain, CMRR and PSRR — min. 120dB; very low intermodulation effects (open-loop phase shift <2°@ chopper frequency).

TYPE	DESCRIPTION	V_{OS} (μV)	ΔV_{OS} (μV/°C)	ΔV_{OS} nV/$\sqrt{\text{month}}$	A_V (dB Min)	SLEW RATE (V/μs)	I_{BIAS} (pA) (Max)	PACKAGE	T_A (°C)
ICL7650C	Ultra Low V_{OS}	±1	±0.01	100	120	2.5	10	J, P, T	0 to +70
ICL7650I	Ultra Low V_{OS}	±1	±0.01	100	120	2.5	10	J, P, T	−25 to +85
ICL7652C	Ultra Low V_{OS}	±1	±0.01	100	120	0.5	30	J, P, T	0 to +70
ICL7652I	Ultra Low V_{OS}	±1	±0.01	100	120	0.5	30	J, P, T	−25 to +85

Operational Amplifiers — FET Input (also see Operational Amplifiers — CMOS)

TYPE	DESCRIPTION	V_{OS} (mV)	I_b (nA)	A_{VOL} (V/V)	GBW (typ) (MHz)	SLEW RATE (V/μs)	I_{SUPPLY} (mA)	T_A (°C)	PACKAGE
8007M	General Purpose, Compensated	20	20	50,000	1.0	6	5.2	−55 to +125	T
8007AM	8007M, Low I_b	30	1.0	20,000	1.0	2.5	6	−55 to +125	T
8007C	General Purpose, Compensated	50	50	20,000	1.0	6	6	0 to +70	T
8007AC	8007C, Low I_b	30	1.0	20,000	1.0	2.5	6	0 to +70	T
8043M	Dual 8007M	20	20	50,000	1.0	6	6	−55 to +125	J
8043C	Dual 8007C	50	50	20,000	1.0	6	6.8	−55 to +125	J, P
8500	MOSFET Input, Compensated	50	0.1	20,000	0.7	0.5	2.7	−25 to +85	T
8500A	MOSFET Input, Super Low I_b	50	0.01	20,000	0.7	0.5	2.7	−25 to +85	T

Operational Amplifiers — Low Noise

TYPE	DESCRIPTION	V_{OS} (mV)	I_b (nA)	A_{VOL} (V/V)	GBW (MHz)	I_{SUPPLY} (mA)	T_A (°C)	PACKAGE	COMMENT
108	Low Level, Uncompensated	2.0	2.0	50,000	1.0	0.6	−55 to +125	J, F, T	
108LN	Guaranteed Noise 108	2.0	2.0	50,000	1.0	0.6	−55 to +125	T	(Note 1)
308	Low Level, Uncompensated	7.5	7.0	25,000	1.0	0.8	0 to +70	F, J, P, T	
308LN	Guaranteed Noise 308	7.5	7.0	25,000	1.0	0.8	0 to +70	T	(Note 1)

Note:
1. $70nV/\sqrt{Hz}$ @ 10Hz

Operational Amplifiers — Low Power Programmable

TYPE	DESCRIPTION	V_{OS} (mV)	I_b (nA)	A_{VOL} (V/V)	GBW (MHz)	I_{SUPPLY} (μA)	@ I_{set} (μA)	V_S (V)	T_A (°C)	PACKAGE*
8021M	Programmable, Compensated	3.0	20	50,000	0.27	40	30	+6.0	−55 to +125	J, T
8021C	Programmable, Compensated	6.0	30	50,000	0.27	50	30	+6.0	0 to +70	T
8022M	Dual 8021M	3.0	20	50,000	0.27	40	30	+6.0	−55 to +125	J, F
8022C	Dual 8021C	6.0	30	50,000	0.27	50	30	+6.0	0 to +70	J, P
8023M	Triple 8021M	3.0	20	50,000	0.27	40	30	+6.0	−55 to +125	J
8023C	Triple 8021C	6.0	30	50,000	0.27	50	30	+6.0	0 to +70	J, P

*Package Key:
D — Solder lid side-brazed ceramic dual-in-line. F — Ceramic flat package. J — Glass frit seal ceramic dual-in-line. P — Plastic dual-in-line. T — Metal can.

Video Amplifiers

TYPE	DESCRIPTION	GAINS (TYP) (V/V)	BANDWIDTHS (TYP) (MHz)	e_n μV_{rms}	OUTPUT OFFSET (V)	I_{SUPPLY} (mA)	T_A (°C)	PACKAGE
733M	Gain Selectable Video Amp	400, 100, 10	40, 90, 120	12	1.5	24	−55 to +125	T
733C	Gain Selectable Video Amp	400, 100, 10	40, 90, 120	12	1.5	24	0 to +70	T
SE592	Gain Programmable Video Amp	0-400	40-90	12	0.75	24	−55 to +125	J, P, T
NE592	Gain Programmable Video Amp	0-400	40-90	12	0.75	24	0 to +70	J, P, T

Power Amplifiers

TYPE	DESCRIPTION	USE	OUTPUT CURRENT (A)	OUTPUT SWING (V)	V_{OS} (mV)	I_b (nA)	A_{VOL} (V/V)	SLEW RATE (V/μs)	QUIESCENT I_{SUPPLY} (mA)	T_A (°C)
ICH8510M	Hybrid Power Amplifier		1.0	±26	3.0	250	100,000	0.5	40	−55 to +125
ICH8510I	Hybrid Power Amplifier	Servo	1.0	±26	6.0	500	100,000	0.5	50	−25 to +85
ICH8515I	Hybrid Power Amplifier		1.25	±12	6.0	500	100,000	0.5	80	−20 to +85
ICH8515M	Hybrid Power Amplifier	Servo	1.5	±12	3.0	250	100,000	0.5	70	−55 to +125
ICH8520M	Hybrid Power Amplifier	Actuator	2.0	±26	3.0	250	100,000	0.5	40	−55 to +125
ICH8520I	Hybrid Power Amplifier	Actuator	2.0	±26	6.0	500	100,000	0.5	50	−25 to +85
ICH8530M	Hybrid Power Amplifier	Actuator	2.7	±25	3.0	250	100,000	0.5	40	−55 to +125
ICH8530I	Hybrid Power Amplifier	Power Transistor	2.7	±25	6.0	500	100,000	0.5	50	−25 to +85
ICL8063C	Monolithic Power Amplifier	Power Transistor	2.0	±27	50		6		250	0 to +70
ICL8063M	Monolithic Power Amplifier	Power Transistor	2.0	±27	75		6		300	−55 to +125

Notes:
1. Specifications apply at ±30V supplies; except the ICH8515, which operates on ±15V supplies.
2. All units packaged in 8-lead TO-3 packages.

Special Function Circuits

TYPE	DESCRIPTION	ACCURACY	V_{SUPPLY} (V)	T_A (°C)	PACKAGE*
AD590I	Temperature transducer — output linear at 1μA/°K. Two terminal current proportional device is particularly useful in remote temperature sensing applications.	±10°C	4 to 30	−55 to +150	T
AD590J		±5.0°C	4 to 30	−55 to +150	T
AD590K		±2.5°C	4 to 30	−55 to +150	T
AD590L		±1.0°C	4 to 30	−55 to +150	T
AD590M		±0.5°C	4 to 30	−55 to +150	T
8013AM	Four quadrant multiplier. Output proportional to algebraic product of two input signals. Features ±0.5% accuracy; internal op amp for level shift, division and square root functions; full ±10V input/output range; 1MHz bandwidth.	±0.5%	±15	−55 to +125	T
8013BM		±1.0%	±15	−55 to +125	T
8013CM		±2.0%	±15	−55 to +125	T
8013AC		±0.5%	±15	0 to +70	T
8013BC		±1.0%	±15	0 to +70	T
8013CC		±2.0%	±15	0 to +70	T
8038AM	Simultaneous Sine, Square, and Triangle wave outputs TTL compatible to 28V over frequency range from 0.01Hz to 1.0MHz. Low distortion (<1%); high linearity (0.1%); low frequency drift with temperature (50ppm/°C max.); variable duty cycle (2%-98%); external frequency modulation.	1.5%	±5 to ±15	−55 to +125	J
8038AC		1.5%	±5 to ±15	0 to +70	J
8038BM		3.0%	±5 to ±15	−55 to +125	J
8038BC		3.0%	±5 to ±15	0 to +70	P
8038CC		5.0%	±5 to ±15	0 to +70	P
8048BC	Log amp 1V/decade (adjustable). 120dB range with current input. Error referred to output.	±30mV	±15	0 to +70	J, P
8048CC		±60mV	±15	0 to +70	J, P
8049BC	Antilog amplifier adjustable scale factor. Error referred to input.	±10mV	±15	0 to +70	J, P
8049CC		±30mV	±15	0 to +70	J, P
8211M	Micropower voltage detector/indicator/voltage regulator/programmable zener. Contains 1.15V micropower reference plus comparator and hysteresis output. Main output inverting (8212) or non-inverting (8211).		2 to 30	−55 to +125	T
8211C			2 to 30	0 to +70	P, T
8212M			2 to 30	−55 to +125	T
8212C			2 to 30	0 to +70	P, T

*Package Key:

D—Solder lid side-brazed ceramic dual-in-line. F—Ceramic flat package. J—Glass frit seal ceramic dual-in-line. P—Plastic dual-in-line. T—Metal can.

CMOS Power Supply Circuits

TYPE	DESCRIPTION	
ICL7660	Voltage Converter	The ICL7660 performs the complete supply voltage conversion from positive to negative for an input range of +1.5V to +10.0V, resulting in complementary output voltages of −1.5V to −10.0V.
ICL7663B ICL7664B	Positive Regulator Negative Regulator	The ICL7663 (positive) and ICL7664 (negative) series regulators are low power, high-efficiency devices which accept inputs from 1.6V to 10V and provide adjustable outputs over the same range at currents up to 40mA. Operating current is typically less than 4μA, regardless of load.
ICL7665B	Programmable Micropower Voltage Detector	The ICL7665 contains two individually programmable voltage detectors on a single chip. Requiring only ~3μA for operation, the device is intended for battery operated systems and instruments which require high or low voltage warnings, settable trip points, or fault monitoring and correction.

Precision Voltage References

TYPE	DESCRIPTION	
ICL8069	Low Voltage Reference	The ICL8069 is a 1.2V temperature compensated voltage reference. It uses the bandgap principle to achieve excellent stability and low noise at reverse currents down to 50μA.

Timers/Counters Without Display Driver

ICM7555		Low power CMOS equivalent of industry standard 555 timer — only 80μA supply current. ICM7555 does not have the large supply current transients of the bipolar 555 and does not require the large bypassing capacitors needed by the 555. Low leakage threshold and trigger inputs allow use of higher impedance RC timing components for extra long time delays.
ICM7556		A dual ICM7555, the ICM7556 is a CMOS, low power equivalent of the industry standard 556 timer.
ICM7240 ICM7250 ICM7260	Binary 0-255 BCD 0-99 Time 0-59	Programmable CMOS counter/timer. Uses on-board RC oscillator or an external clock. The count is programmed by wire-AND connection of the outputs. Excellent for ON/OFF delay timers, ÷N counters, and long period delays.
ICM7242	Fixed 128/255	RC oscillator + 8-bit counter, similar to ICM7240 but with fixed 256 count. Used for extremely long time delays. Cascadable.

Display Driver Selector Guide

DISPLAY DRIVER PART NUMBER	# OF CHARACTERS OR DIGITS				DISPLAY TYPE						FONT			INTERFACE					FEATURES AND COMMENTS
	# of 7-Segment Digits	# of Decimal Points or Annunciators	# of Alphanumeric 14 Segments + D.P.	# of Alphanumeric 16 Segments + D.P.	LED, Common Cathode Non-MUX	LED, Common Cathode MUX	LED, Common Anode MUX	LCD, Direct Drive	LCD, Triplexed	Vacuum Flourescent	Hexadecimal (0-9, A-F)	Code B (0-9, H, E, L, P, -, and Blank)	ASCII (64 Character Alphanumeric)	MUX BCD (BCD + Digit Select Strobes)	Random Access (Data + Address + WR)	Bit Parallel, Digit Serial	Bit Serial, Digit Serial	Access Time (ns)	
ICM7211	4							●			●			●				1000	Evaluation Kit is available
ICM7211A	4							●				●		●				1000	
ICM7211M	4							●			●				●			200	
ICM7211AM	4							●				●			●			200	
ICM7212	4				●						●			●				1000	Evaluation Kit is available
ICM7212A	4				●							●		●				1000	
ICM7212M	4				●						●				●			200	
ICM7212AM	4				●							●			●			200	
ICM7218A	8	8					●				●	●				●		550	Also has "No Decode" Mode for controlling 64 independent LEDs
ICM7218B	8	8				●					●	●				●		550	Also has "No Decode" Mode for controlling 64 independent LEDs
ICM7218C	8	8					●				●	●			●			500	
ICM7218D	8	8				●					●	●			●			500	
ICM7218E	8	8					●				●	●			●			500	"No Decode" Mode
ICM7231A	8	16							●		●				●			500	16 Annunciators on COM 3
ICM7231B	8	16							●			●			●			500	16 Annunciators on COM 3
ICM7231C	8	16							●			●			●			500	8 Annunciators on COM 1, 8 on COM 3
ICM7232A	10	20							●		●						●	350	20 Annunciators on COM 3
ICM7232B	10	20							●			●					●	350	20 Annunciators on COM 3
ICM7232C	10	20							●			●					●	350	10 Annunciators on COM 1, 10 on COM 3
ICM7233A				4					●				●		●			500	Alphanumeric, Half-width Numbers, Evaluation Kit available
ICM7233B				4					●				●		●			500	Alphanumeric, Full-width Numbers
ICM7234A				5					●				●				●	350	Alphanumeric, Half-width Numbers
ICM7234B				5					●				●				●	350	Alphanumeric, Full-width Numbers
ICM7235	4									●	●			●				1000	
ICM7235A	4									●		●		●				1000	
ICM7235M	4									●	●				●			200	
ICM7235AM	4									●		●			●			200	
ICM7243A				8		●							●		●			250	Also has "Daisy Chain"
ICM7243B			8			●							●		●			250	Cascading of Multiple ICs; ICM7243B Evaluation Kit is available
ICM7280	LCD Dot Matrix Row Driver																		Selectable 7, 8, 9 or 10 MUXed Rows (available Summer 1984)
ICM7281	LCD Dot Matrix Column Driver																		40 Columns (available Summer 1984)
ICM7283	LCD Dot Matrix Row Driver																		16 Rows (available Summer 1984)

Counters with Display Drivers

PART NUMBER	NUMBER OF DIGITS	DISPLAY: LED: Common Cathode, Non-MUX	DISPLAY: LED: Common Cathode, MUX	DISPLAY: LED: Common Anode, MUX	DISPLAY: LCD: Direct Drive, Non-MUX	DISPLAY: VF: Non-MUX	FUNCTIONS: UNIT COUNT: Up/Down	FUNCTIONS: UNIT COUNT: Up Only	FUNCTIONS: UNIT COUNT: Decade	FUNCTIONS: UNIT COUNT: Module 60 (Hr/Min/Sec)	FUNCTIONS: UNIVERSAL COUNTERS: Frequency	FUNCTIONS: UNIVERSAL COUNTERS: Period	FUNCTIONS: UNIVERSAL COUNTERS: Frequency Ratio	FUNCTIONS: UNIVERSAL COUNTERS: Time Interval	FUNCTIONS: MUX BCD Outputs	FUNCTIONS: Display Latch	FUNCTIONS: Display Blanking	FUNCTIONS: Count Enable	FUNCTIONS: Leading Zero Blanking	FUNCTIONS: Preset Count	FUNCTIONS: Comparison Register	FUNCTIONS: Equal and Zero Output	MAX COUNT SPEED (MHz)	Evaluation Kit Available	TYPICAL APPLICATIONS AND COMMENTS
ICM7208	7		●					●	●		*					●	●	●	●				2.5		Use with ICM7207/A for 7-digit frequency counter
ICM7216A	8			●				●	●		●	●	●	●		●	●		●				10		Instruments and data acquisition/ display
ICM7216B	8		●					●	●		●	●	●	●		●	●		●				10		
ICM7216C	8			●				●	●		●					●	●		●				10		Single-chip frequency counter
ICM7216D	8		●					●	●		●					●	●		●				10		
ICM7217	4			●			●		●		*				●	●	●		●	●	●	●	2		Industrial control: preset/predetermining counters, sequencers, on/off delay timers, batch counters. Presets and loads compare register from thumbwheel switches
ICM7217A	4		●				●		●		*				●	●	●		●	●	●	●	2		
ICM7217B	4			●			●			●					●	●	●		●	●	●	●	2		
ICM7217C	4		●				●			●					●	●	●		●	●	●	●	2		
ICM7224	4½				●			●	●		*					●		●					15	●	10μA operating current. Can be cascaded for more digits
ICM7224A	4½				●			●		●						●		●					15		
ICM7225	4½	●						●	●		*					●	●	●					15	●	Has brightness adjustment, 10μA current with display blanked, cascadable
ICM7225A	4½	●						●								●	●	●					15		
ICM7226A	8			●				●	●		●	●	●	●	●	●	●	●	●				10	●	Instruments and data acquisition systems. Also performs period and time interval averaging
ICM7226B	8		●					●	●		●	●	●	●	●	●	●	●	●				10		
ICM7227	4			●			●		●		*				●	●	●		●	●	●	●	2		Microprocessor compatible interface. Industrial control: preset/predetermining counters, sequencers, on/off delay timers, batch counters. Presets and loads compare register from a microprocessor
ICM7227A	4		●				●		●		*				●	●	●		●	●	●	●	2		
ICM7227B	4			●			●								●	●	●		●	●	●	●	2		
ICM7227C	4		●				●								●	●	●		●	●	●	●	2		
ICM7236	4½					●		●	●		*					●	●	●	●				15	●	Up to 30V output drive for Vacuum Fluorescent
ICM7236A	4½					●		●		●						●	●	●	●				15		

*These counters will measure frequency when used with the ICM7207 (0.01 and 0.1 second timebase) or the ICM7207A (0.1 and 1.0 second timebase)

Oscillator/Divider Selector Guide

OUTPUT FREQUENCY	PART NUMBER	V+ (V)	TYPICAL CURRENT (μA)	PULSE WIDTH (ms)	CRYSTAL FREQUENCY	OTHER OUTPUTS/COMMENTS
1 Pulse/Min	ICM7213	2-4	100	125, 1000	4.19MHz	1 Pulse/Sec, 2048, 1024, 34.133, 16Hz
0.5Hz	ICM7207A	4-5.5	260	1000, 0.391	5.24288MHz	5Hz, 1600Hz (Note 1)
1Hz	ICM7213	2-4	100	7.8	4.19MHz	1 Pulse/Min, 2048, 1024, 34.133, 16Hz
5Hz	ICM7207A	4-5.5	260	100, 0.391	5.24288MHz	0.5, 1600Hz
5Hz	ICM7207	4-5.5	260	100, 0.312	6.5536MHz	50Hz, 1280Hz
16Hz	ICM7213	2-4	100	Sq. Wave	4.19MHz	1 Pulse/Min, 2048, 1024, 34.133, 1Hz
50Hz	ICM7207	4-5.5	260	20, 0.312	6.5536MHz	5Hz, 1280Hz
1000Hz	ICM7213	2-4	100	Sq. Wave	4.096MHz	2000, 2000 Pulses/Min
1024HZ	ICM7213	2-4	100	Sq. Wave	4.19MHz	1 Pulse/Min, 2048, 34.133, 16, 1Hz
1280Hz	ICM7207A	4-5.5	260	Sq. Wave	5.24288MHz	0.5, 5Hz
1600Hz	ICM7207	4-5.5	260	Sq. Wave	6.5536MHz	5, 50Hz
2048Hz	ICM7213	2-4	100	Sq. Wave	4.19MHz	1 Pulse/Min, 1024, 34.133, 16, 1Hz
250kHz-10MHz	ICM7209	4.5-5.5	11,000	Sq. Wave	1-10MHz	(Note 2)

Notes:
1. Oscillator/controller for frequency counter.
2. Two buffered outputs — Crystal Frequency and ÷8 output. Drives up to 5 TTL loads.

Related Products

ICM7206 DTMF (TOUCHTONE®) Encoder. Normally operating with a 3.58MHz crystal, the ICM7206 can be used to divide a high frequency signal by the following ratios: 2176, 2432, 2688, 2944, 3776, 3968, 4224, 4672, and 5120.

Analog Switch Selector Guide

FAMILY	FEATURES	SWITCH TYPE	$r_{(ON)}$ Ω Max	$I_{D(OFF)}$ (nA) Max	$t_{(ON)}$ (ns) Max	$t_{(OFF)}$ (ns) Max	ANALOG VOLTAGE RANGE (V) (w/±15V_S)	SPST	DUAL SPST	QUAD SPST	SPDT	DUAL SPDT	DPST	DUAL DPST	DPDT	4PST
Configuration:																
DG200/201	Industry standard, low leakage, low cost	CMOS	70	2	700	250	±15		DG200	DG201						
IH5040-53	Very low quiescent current, good speed	CMOS	75 35	0.1	500 250	250 150	±15	IH5040	IH5041 IH5048	IH5053 IH5052	IH5042	IH5043 IH5051	IH5044	IH5045 IH5049	IH5046	IH5047
IH5140-51	High switching speed, low quiescent current, low leakage	CMOS	50	0.1	100–200	75–125	−15 to +14	IH5140	IH51541		IH5142	IH5143	IH5144	IH5145		
DGM181-191	Monolithic CMOS replacement for DG180 family; high-speed, low $r_{DS(ON)}$	CMOS	30–75	0.2	250	130	−10 to +15		DGM182		DGM188	DGM191		DGM185		
DG180-191	Mature, industry standard switch; low $r_{DS(ON)}$, high switching speed	NJFET	10 30 75	10 1 1	300 150 250	250 130 130	−7.5 to +15 −7.5 to +15 −10 to +15		DG180 DG181 DG182		DG186 DG187 DG188	DG189 DG190 DG191		DG183 DG184 DG185		
IH5341	Video/RF switch, 75Ω $r_{DS(ON)}$ flat for DC to 100MHz, off isolation >60dB min @ 10MHz	CMOS	75	0.1	300	150	±15		IH5341							
IH5009-24	Lowest cost; virtual ground switches	PJFET	100 150 100 150	0.2	500	500	±0.2	IH5021 IH5022 IH5023 IH5024	IH5017 IH5018 IH5019 IH5020	IH5009 IH5010 IH5011 IH5012						
IH6201 (Driver), IH401/A (Varafet)	Translates TTL logic levels to 30V levels for JFET gate drive; lowest charge injections, low $r_{DS(ON)}$	CMOS Driver & FET w/ Vara. Diode	30	250	456									IH6201 IH401/A		

Multiplexer Selector Guide

FAMILY	FEATURES	$r_{(ON)}$ Ω Max	$I_{S(OFF)}$ (nA) Max	$t_{(ON)}$ (μs) Max	$t_{(OFF)}$ (μs) Max	ANALOG VOLTAGE RANGE (V) (w/±15V_S)	CONFIGURATION 8-CHANNEL SINGLE-ENDED	4-CHANNEL DIFFERENTIAL	16-CHANNEL SINGLE-ENDED	8-CHANNEL DIFFERENTIAL
Configuration:										
IH6108	Industry standard pinouts, low leakage, low $r_{DS(ON)}$, break before make	300 600	0.05 0.1	0.1 0.1	1.5 1.5	±15 ±15	IH6108	IH6208	IH6116	IH6216
IH5108	Industry standard pinout; superior fault protection up to ±25V input, ultra low leakage, no SCR latchup, only nA of input current — even with 25V inputs	900	0.05	1.5	1.0	±25V Input ±13.5V Output	IH5108	IH5208		

Discrete Selector Guide

DETAILED APPLICATION	IMPORTANT PARAMETERS	RECOMMENDED PART NUMBERS							
		SINGLE N-CHANNEL JFET	SINGLE P-CHANNEL JFET	DUAL N-CHANNEL JFET	SINGLE N-CHANNEL MOSFET	SINGLE P-CHANNEL MOSFET	DUAL P-CHANNEL MOSFET	DUAL NPN BIPOLAR	DUAL PNP BIPOLAR
Amplifiers									
Audio	Low Noise	2N4220 2N3821	2N2607 2N5460	2N3958 IT503	2N4351 M116	3N163 3N172	3N165 3N188	2N4044 IT120 IT126 IT124	IT130 IT131
Buffer	Low Leakage High Gain	2N4221	2N2609 2N5462	2N5905	2N4351 M116	3N163 3N172	3N165 3N188	2N4044 IT120 IT126 IT124	IT130 IT131
Differential	Good Matching and Drift			2N3954 U401 2N5520			3N165 3N188	2N4044 IT120 IT126 IT124	IT130 IT131
FET Input Op Amp	Good Matching and Drift			2N3954 U401 2N5520			3N165 3N188		
High Impedance	Low Leakage	2N4117A	IT100 J176 2N5116	2N5905 IT503	2N4351 M116	3N163 3N172	3N165 3N188		
High Frequency	High Gain Low Capacitance	U308 2N5397	2N5114 J176	2N5912 IT5912	2N4351 M116	3N163 3N172	3N165 3N188	2N4044 IT120 IT126 IT124	IT130 IT136 2N3810
Low Supply Voltage	Low Pinch-Off Voltage	2N4338	2N5265 J177	U406 2N3958	2N4351 M116	3N163 3N172	3N165 3N188	2N4044 IT120 IT126 IT124	IT130 IT136 2N3810
Low Noise	Low Noise	2N4867A	2N5116 J176	2N5520 2N5199	2N4351 M116	3N163 3N172	3N165 3N188		
Preamplifier	High Gain	J310 U310 2N4393 ITE4393	2N5116 J176 IT100	IT550 U406 IT5912 2N5912	2N4351 M116	3N163 3N172	3N165 3N188	2N4044 IT120 IT126 IT124	IT130 IT136 2N3810
Video	High Gain Low Capacitance	J310 U310 2N4393 ITE4393	2N5116 J176 IT100	IT550 U406 IT5912 2N5912	2N4351 M116	3N163 3N172	3N165 3N188	2N4044 IT120 IT126 IT124	IT130 IT136 2N3810
Mixers									
VHF/UHF	RF Parameters High g_{fs}/C_{iss}	U310 J310 2N5484 2N5397	IT100 J174 2N5114	2N6485 IT5912 2N5912					

Discrete Selector Guide — Continued

DETAILED APPLICATION	IMPORTANT PARAMETERS	RECOMMENDED PART NUMBERS							
		SINGLE N-CHANNEL JFET	SINGLE P-CHANNEL JFET	DUAL N-CHANNEL JFET	SINGLE N-CHANNEL MOSFET	SINGLE P-CHANNEL MOSFET	DUAL P-CHANNEL MOSFET	DUAL NPN BIPOLAR	DUAL PNP BIPOLAR
Switches									
Commutators	Low C_{rss}	2N4392 ITE4391 ITE4393	2N3993-4 2N5114-6	IT550 2N5912	3N170	3N163 3N164	3N165 3N188		
Sample and Hold	Low C_{rss}	2N4392 ITE4391 ITE4393	2N3993-4 2N5114-6	IT550 2N5912	3N170	3N163 3N164	3N165 3N188		
Analog Gates	Fast Switching Low $r_{DS(ON)}$	2N4091-3 2N4391-3 ITE4391-3 2N5432-4 J111-3	2N5114-6 J174-7 IT100-1	IT550 2N5912	3N170	3N163 3N164	3N165 3N188		
Digital	Fast Switching Low $r_{DS(ON)}$	2N4091-3 2N4391-3 ITE4391-3 2N5432-4 J111-3	2N5114-6 J174-7 IT100-1	IT550 2N5912	3N170	3N163 3N164	3N165 3N188		
Chopper	Fast Switching Low $r_{DS(ON)}$	2N4091-3 2N4391-3 ITE4391-3 2N5432-4 J111-3	2N5114-6 J174-7 IT100-1	IT550 2N5912	3N170	3N163 3N164	3N165 3N188		
Integrator Reset	Low $r_{DS(ON)}$, High I_{DSS}	2N4091-3 2N4391-3 ITE4391-3 2N5432-4 J111-3	2N5114-6 J174-7 IT100-1	IT550 2N5912	3N170	3N163 3N164	3N165 3N188		
Voltage Controlled Resistors									
Gain Control	High $V_{GS(OFF)}$	VCR2N VCR4N VCR7N	VCR3P VCR5P	VCR11N					
Amplitude Stability	High $V_{GS(OFF)}$	VCR2N VCR4N VCR7N	VCR3P VCR5P	VCR11N					
Attenuators	High $V_{GS(OFF)}$	VCR2N VCR4N VCR7N	VCR3P VCR5P	VCR11N					
Protection Diodes									
Signal Clipping and Clamping	Low Leakage Current							ID100-1	
Bipolar Transistor Pair									
Logarithmic Amplifiers	High β Matched V_{BE}							IT124	

Switches — Junction FET

PART NUMBER	PACKAGE	$r_{DS(ON)}$ Ω Max	V_P V Min	Max	I_{GSS} pA Max	BV_{GSS} V Min	$I_{D(OFF)}$ pA Max	I_{DSS} mA Min	Max	t_{ap} ns Max	C_{rss} pF Max	C_{iss} pF Max	COMMENTS
N-Channel:													
2N4391	TO-18	30	−4.0	−10.0	−100	−40	100	50	150	55	14	3.5	High Isolation
2N4392	TO-18	60	−2.0	−5.0	−100	−40	100	25	75	75	14	3.5	High Isolation
2N4393	TO-18	100	−0.5	−3.0	−100	−40	100	5	30	100	14	3.5	High Isolation
2N4856	TO-18	25	−4.0	−10.0	−250	−40	250	50		34	18	6.0	High Isolation
2N4857	TO-18	40	−2.0	−6.0	−250	−40	250	20	100	60	18	6.0	High Isolation
2N4858	TO-18	60	−0.8	−4.0	−250	−40	250	8	80	120	18	6.0	High Isolation
2N5432	TO-52	5	−4.0	−10.0	−200	−25	200	150		41	30	15.0	Low $r_{DS(ON)}$
2N5433	TO-52	7	−3.0	−9.0	−200	−25	200	100		41	30	15.0	Low $r_{DS(ON)}$
2N5434	TO-52	10	−1.0	−4.0	−200	−25	200	30		41	30	15.0	Low $r_{DS(ON)}$
ITE4391	TO-92	60	−4.0	−10.0	−100	−40	100	50	150	55	14	3.5	Low Cost
ITE4392	TO-92	100	−2.0	−10.0	−100	−40	100	25	75	75	14	3.5	Low Cost
ITE4393	TO-92	30	−0.5	−10.0	−100	−40	100	5	30	100	14	3.5	Low Cost
J105	TO-92	3	−4.5	−10.0	−3nA	−25	3nA	500		20			Lowest $r_{DS(ON)}$
J106	TO-92	6	−2.0	−6.0	−3nA	−25	3nA	200		20			Lowest $r_{DS(ON)}$
J107	TO-92	8	−0.5	−4.5	−3nA	−25	3nA	100		20			Lowest $r_{DS(ON)}$
J111	TO-92	30	−3.0	−10.0	1nA	35	1nA	20					Lowest Cost
J112	TO-92	50	−1.0	−5.0	1nA	35	1nA	5					Lowest Cost
J113	TO-92	100	−0.5	−3.0	1nA	35	1nA	2					Lowest Cost
P-Channel:													
2N5114	TO-18	75	5.0	10.0	500	30	500	−30	−90	37	25	7.0	Low $r_{DS(ON)}$
2N5115	TO-18	100	3.0	6.0	500	30	500	−15	−60	68	25	7.0	Low $r_{DS(ON)}$
2N5116	TO-18	150	1.0	4.0	500	30	500	−5	−25	102	25	7.0	Low $r_{DS(ON)}$
IT100	TO-18	75	2.0	4.5	200	35	100	−10			35	12.0	TTL Compatible
IT101	TO-18	60	4.0	10.0	200	35	100	−20			35	12.0	TTL Compatible
J174	TO-92	85	5.0	10.0	1nA	30	−1nA	−20	−100				Low Cost
J175	TO-92	125	3.0	6.0	1nA	30	−1nA	−7	−60				Low Cost
J176	TO-92	250	1.0	4.0	1nA	30	−1nA	−2	−25				Low Cost
J177	TO-92	300	0.8	2.25	1nA	30	−1nA	−1.5	−20				TTL Compatible

Amplifiers — Junction FET

PART NUMBER	PACKAGE	g_{fs} μmho Min	I_{DSS} mA Min	I_{DSS} mA Max	V_P V Min	V_P V Max	I_{GSS} pA Max	BV_{GSS} V Min	C_{iss} pF Max	C_{rss} pF Max	e_n nV/√Hz Max	COMMENTS
N-Channel:												
2N4117	TO-72	70	0.03	0.09	−0.6	−1.8	−10	−40	3	1.5		Low Leakage
2N4117A	TO-72	70	0.03	0.09	−0.6	−1.8	−1	−40	3	1.5		Low Leakage
2N4118	TO-72	80	0.08	0.24	−1.0	−3.0	−10	−40	3	1.5		Low Leakage
2N4118A	TO-72	80	0.08	0.24	−1.0	−3.0	−1	−40	3	1.5		Low Leakage
2N4119	TO-72	100	0.2	0.6	−2.0	−6.0	−10	−40	3	1.5		Low Leakage
2N4119A	TO-72	100	0.2	0.6	−2.0	−6.0	−1	−40	3	1.5		Low Leakage
2N4220	TO-72	1000	0.5	3.0		−4.0	−100	−30	6	2.0		Low Cost
2N4221	TO-72	2000	2.0	6.0		−6.0	−100	−30	6	2.0		Low Cost
2N4222	TO-72	2500	5.0	15.0		−8.0	−100	−30	6	2.0		Low Cost
2N4223	TO-72	3000	3.0	18.0	−0.1	−8.0	−250	−30	6	2.0		Low Cost
2N4224	TO-72	2000	2.0	20.0	−0.1	−0.8	−150	−30	6	2.0		Low Cost
2N4338	TO-18	600	0.2	0.6	−0.3	−1.0	−100	−50	7	3.0	65 @ 1kHz	General Purpose Amp
2N4339	TO-18	800	0.5	1.5	−0.6	−1.8	−100	−50	7	3.0	65 @ 1kHz	General Purpose Amp
2N4340	TO-18	1300	1.2	3.6	−1.0	−3.0	−100	−50	7	3.0	65 @ 1kHz	General Purpose Amp
2N4341	TO-18	2000	3.0	9.0	−2.0	−6.0	−100	−50	7	3.0	65 @ 1kHz	General Purpose Amp
2N4416	TO-72	4500	5.0	15.0		−6.0	−100	−30	4	2.0		High Gain
2N4867A	TO-72	700	0.1	1.2	−0.7	−2.0	−250	−40	25	5.0	5 @ 1kHz	Low Noise/GPA
2N4868A	TO-72	1000	1.0	3.0	−1.0	−3.0	−250	−40	25	5.0	5 @ 1kHz	Low Noise/GPA
2N4869A	TO-72	1300	2.5	7.5	−1.8	−5.0	−250	−40	25	5.0	5 @ 1kHz	Low Noise/GPA
2N5457	TO-92	1000	1.0	5.0	−0.5	−6.0	−1nA	25	7	3.0	3dB @ 1kHz	Low Cost/GPA
2N5458	TO-92	1500	2.0	9.0	−1.0	−7.0	−1nA	25	7	3.0	3dB @ 1kHz	Low Cost/GPA
2N5459	TO-92	2000	4.0	16.0	−2.0	−8.0	−1nA	−25	7	3.0	3dB @ 1kHz	Low Cost/GPA
2N5484	TO-92	3000	1.0	5.0	−0.3	−0.3	−1nA	−25	5	1.0	120 @ 1kHz	Low Cost RF Amp
2N5485	TO-92	3500	4.0	10.0	−0.5	−4.0	−1nA	−25	5	1.0	120 @ 1kHz	Low Cost RF Amp
2N5486	TO-92	4000	8.0	20.0	−2.0	−6.0	−1nA	−30	5	1.0	120 @ 1kHz	Low Cost RF Amp
ITE4416	TO-92	4500	5.0	15.0		−6.0	100	−30	4	2.0		Low Cost RF Amp
J308	TO-92	8000	12.0	60.0	−1.0		−1nA	−25			2.7dB @ 450MHz	VHF Amp/Low Cost
J309	TO-92	10,000	12.0	30.0	−1.0		−1nA	−25			2.7dB @ 450MHz	VHF Amp/Low Cost
J310	TO-92	8000	24.0	60.0	−2.0		−1nA	−25			2.7dB @ 450MHz	VHF Amp/Low Cost
U308	TO-52	10,000	12.0	60.0	−1.0	−6.0	−150	−25	7typ.	4.0typ.	2.7dB @ 450MHz	VHF Amp
U309	TO-52	10,000	12.0	30.0	−1.0	−4.0	−150	−25	7typ.	4.0typ.	2.7dB @ 450MHz	VHF Amp
U310	TO-52	10,000	24.0	60.0	−2.5	−6.0	−150	−25	7typ.	4.0typ.	2.7dB @ 450MHz	VHF Amp
P-Channel:												
2N2607	TO-18	330	−0.3	−1.5	1.0	4.0	3	30	7	2	400 @ 1kHz	Low Noise/GPA
2N2608	TO-18	1000	−0.9	−4.5	1.0	4.0	10	30	7	2	180 @ 1kHz	Low Noise/GPA
2N2609	TO-18	2500	−2.0	−10.0	1.0	4.0	30	30	7	2	180 @ 1kHz	Low Noise/GPA
2N5460	TO-92	1000	−1.0	−5.0	0.75	6.0	5	40	7	2	115 @ 100kHz	Low Noise/Low Cost
2N5461	TO-92	1500	−2.0	−9.0	1.0	7.5	5	40	7	2	115 @ 100kHz	Low Noise/Low Cost
2N5462	TO-92	2500	−4.0	−16.0	1.5	9.0	5	40	7	2	115 @ 100kHz	Low Noise/Low Cost
2N5463	TO-92	1000	−1.0	−5.0	0.75	6.0	5	60	7	2	115 @ 100kHz	Low Noise/Low Cost
2N5464	TO-92	1500	−2.0	−9.0	1.0	7.5	5	60	7	2	115 @ 100kHz	Low Noise/Low Cost
2N5465	TO-92	2500	−4.0	−16.0	1.8	9.0	5	60	7	2	115 @ 100kHz	Low Noise/Low Cost

Differential Amplifiers — Dual Monolithic N-Channel Junction FETs

PART NUMBER	PACKAGE	V_{GS1-2} mV Max	ΔV_{GS} µV/°C Max	I_G pA Max	BV_{GSS} V Min	V_P V Min	V_P V Max	g_{fs} mmho Min	g_{fs} mmho Max	I_{DSS} mA Min	I_{DSS} mA Max	e_n nV/√Hz Max	COMMENTS
2N3954	TO-71	5	10	−50	−50	−1.0	−4.5	1	3	0.5	5.0	160 @ 100Hz	General Purpose
2N3954A	TO-71	5	5	−50	−50	−1.0	−4.5	1	3	0.5	5.0	160 @ 100Hz	General Purpose
2N3955	TO-71	10	25	−50	−50	−1.0	−4.5	1	3	0.5	5.0	160 @ 100Hz	General Purpose
2N3955A	TO-71	10	10	−50	−50	−1.0	−4.5	1	3	0.5	5.0	160 @ 100Hz	General Purpose
2N3956	TO-71	15	50	−50	−50	−1.0	−4.5	1	3	0.5	5.0	160 @ 100Hz	General Purpose
2N3957	TO-71	20	75	−50	−50	−1.0	−4.5	1	3	0.5	5.0	160 @ 100Hz	General Purpose
2N3958	TO-71	25	100	−50	−50	−1.0	−4.5	1	3	0.5	5.0	160 @ 100Hz	General Purpose
2N5196	TO-71	5	5	−15	−50	−0.7	−4.0	0.7 @ 200µA		0.7	7.0	20 @ 1kHz	Low Noise, GPA
2N5197	TO-71	5	10	−15	−50	−0.7	−4.0	0.7 @ 200µA		0.7	7.0	20 @ 1kHz	Low Noise, GPA
2N5198	TO-71	10	20	−15	−50	−0.7	−4.0	0.7 @ 200µA		0.7	7.0	20 @ 1kHz	Low Noise, GPA
2N5199	TO-71	15	40	−15	−50	−0.7	−4.0	0.7 @ 200µA		0.7	7.0	20 @ 1kHz	Low Noise, GPA
2N5520	TO-71	5	5	−100	−40	−0.7	−4.0	1	4	0.5	7.5	15 @ 10Hz	Lowest Noise
2N5521	TO-71	5	10	−100	−40	−0.7	−4.0	1	4	0.5	7.5	15 @ 10Hz	Lowest Noise
2N5522	TO-71	10	20	−100	−40	−0.7	−4.0	1	4	0.5	7.5	15 @ 10Hz	Lowest Noise
2N5523	TO-71	15	40	−100	−40	−0.7	−4.0	1	4	0.5	7.5	15 @ 10Hz	Lowest Noise
2N5524	TO-71	15	80	−100	−40	−0.7	−4.0	1	4	0.5	7.5	15 @ 10Hz	Lowest Noise
2N5906	TO-99	5	5	−1	−40	−0.6	−4.5	0.07	0.25	0.03	0.05	100 @ 1kHz	Low Leakage
2N5907	TO-99	5	10	−1	−40	−0.6	−4.5	0.07	0.25	0.03	0.05	100 @ 1kHz	Low Leakage
2N5908	TO-99	10	20	−1	−40	−0.6	−4.5	0.07	0.25	0.03	0.05	100 @ 1kHz	Low Leakage
2N5909	TO-99	15	40	−1	−40	−0.6	−4.5	0.07	0.25	0.03	0.05	100 @ 1kHz	Low Leakage
2N5911	TO-99	10	20	−100	−25	−1.0	−5.0	5/10 @ 5mA		7.0	40.0	20 @ 10kHz	RF Amplifier
2N5912	TO-99	15	40	−100	−25	−1.0	−5.0	5/10 @ 5mA		7.0	40.0	20 @ 10kHz	RF Amplifier
IT500	TO-52	5	5	−5	−50	−0.7	−4.0	0.7	1.6	0.7	7.0	35 @ 10Hz	Cascode RF Amp
IT501	TO-52	5	10	−5	−50	−0.7	−4.0	0.7	1.6	0.7	7.0	35 @ 10Hz	Cascode RF Amp
IT502	TO-52	10	20	−5	−50	−0.7	−4.0	0.7	1.6	0.7	7.0	35 @ 10Hz	Cascode RF Amp
IT503	TO-52	15	40	−5	−50	−0.7	−4.0	0.7	1.6	0.7	7.0	35 @ 10Hz	Cascode RF Amp
IT504	TO-52	25	100	−5	−25	−0.7	−4.0	0.7	1.6	0.7	7.0	35 @ 10Hz	Cascode RF Amp
IT505	TO-52	50	200	−5	−25	−0.7	−4.0	0.7	1.6	0.7	7.0	35 @ 10Hz	Cascode RF Amp
IT550	TO-71	50	100	−100*	−40	−0.5	−3.0	7.5/12.5 @ 2mA		5.0	30.0	50 @ 10Hz	Cascode RF Amp

*I_{DSS}

Differential Amplifiers — Dual Monolithic P-Channel MOSFETs (Enhancement)

PART NUMBER	PACKAGE	$V_{GS(TH)}$ V Min	$V_{GS(TH)}$ V Max	BV_{DDS} V Min/Max	I_{DDS} pA Max	I_{GSS} pA Max	g_{fs} µmho Min	$I_{D(ON)}$ mA Min	$I_{D(ON)}$ mA Max	$r_{DS(ON)}$ Ω Max	V_{GS1-2} mV Max	COMMENTS
3N165	TO-99	−2	−5	−40	−200	−10	1500	−5.0	−30	300	100	Low Leakage
3N166	TO-99	−2	−5	−40	−200	−10	1500	−5.0	−30	300		Low Leakage
3N188	TO-99	−2	−5	−40	−200	−200	1500	−5.0	−30	300	100	Diode Protected
3N189	TO-99	−2	−5	−40	−200	−200	1500	−5.0	−30	300		Diode Protected

Differential Amplifiers — Dual NPN Bipolar Transistors

PART NUMBER	PACKAGE	V_{BE1-2} mV Max	ΔV_{BE} µV/°C Max	h_{FE} (Note 1) Min	I_{B1-2} (Note 1) nA Max	BV_{CEO} V Min	I_{CBO} nA Max	Noise dB Max	f_t MHz @ I_C Min	C_{obo} pF Max	COMMENTS
2N4044	TO-78	3	3	200	5	60	0.1	2	200 @ 1 mA	0.8	Low Capacitance
2N4045	TO-78	5	10	80	25	45	0.1	3	150 @ 1 mA	0.8	Low Capacitance
2N4100	TO-78	5	5	150	10	55	0.1	3	150 @ 1 mA	0.8	Low Capacitance
IT120	TO-78 TO-71	2	5	200	5	45	1.0	2 typ.	150 @ 1 mA	2	Low Cost, Low V_{OS}
IT120A	TO-78 TO-71	1	3	200	2.5	45	1.0	2 typ.	150 @ 1 mA	2	Low Cost, Low V_{OS}
IT121	TO-78 TO-71	3	10	80	25	45	1.0	2 typ.	180 @ 1 mA	2	Low Cost
IT122	TO-78 TO-71	5	20	80	25	45	1.0	2 typ.	180 @ 1 mA	2	Low Cost
IT124	TO-78	5	10	1500	0.6 A (Note 2)	2	0.1	3	100 @ 200 µA	0.8	Super β for Log Amps
IT126	TO-78 TO-71	1	3	200	2.5	60	0.1	1 typ.	250 @ 10 mA	4	Low V_{OS}
IT127	TO-78 TO-71	2	5	200	5	45	0.1	1 typ.	250 @ 10 mA	4	Low V_{OS}
IT128	TO-78 TO-71	5	10	100	10	45	0.5	1 typ.	250 @ 10 mA	4	Low V_{OS}
IT129	TO-78 TO-71	10	20	100	25	45	0.5	1 typ.	250 @ 10 mA	4	Low V_{OS}

Differential Amplifiers — Dual PNP Bipolar Transistors

PART NUMBER	PACKAGE	V_{BE1-2} mV Max	ΔV_{BE} µV/°C Max	h_{FE} (Note 1) Min	I_{B1-2} (Note 1) nA Max	BV_{CEO} V Min	I_{CBO} nA Max	Noise dB Max	f_t MHz @ I_C Min	C_{obo} pF Max	COMMENTS
IT130	TO-78 TO-71	2	5	200	5	−45	1.0	2 typ.	150 @ 1 mA	2	Low V_{OS}
IT130A	TO-78 TO-71	1	3	200	2.5	−60	1.0	2 typ.	150 @ 1 mA	2	Low V_{OS}
IT131	TO-78 TO-71	5	10	80	10	−45	1.0	2 typ.	150 @ 1 mA	2	Low Cost
IT132	TO-78 TO-71	10	20	80	25	−45	1.0	2 typ.	150 @ 1 mA	2	Low Cost
IT136	TO-78 TO-71	1	3	200	2.5	−60	0.1	2 typ.	250 @ 10 mA	4	Low V_{OS}
IT137	TO-78 TO-71	2	5	200	5	−45	0.1	2 typ.	250 @ 10 mA	4	Low V_{OS}
IT138	TO-78 TO-71	5	10	100	10	−45	0.5	2 typ.	250 @ 10 mA	4	Low V_{OS}
IT139	TO-78 TO-71	10	20	100	25	−45	0.5	2 typ.	250 @ 10 mA	4	Low V_{OS}

Note:
1. I_C=10µA, V_{CE}=5V

Switches and Amplifiers — MOSFET

PART NUMBER	PACKAGE	$V_{GS(TH)}$ $V_{GS(OFF)}$ V Min	V Max	BV_{GSS} V Min	I_{DSS} pA Max	I_{GSS} pA Max	g_{fs} μmho Min	$r_{DS(ON)}$ Ω Max	$I_{D(ON)}$ mA Min	$I_{D(ON)}$ mA Max	COMMENTS
P-Channel: Generally used where max. isolation between signal source and logic drive is required: switch "On" resistance varies with signal amplitude.											
3N161	TO-72	−1.5	−5.0	−25	−10nA	−100	3500		−40	−120	Diode Protected
3N163	TO-72	−2.0	−5.0	−40	−200	−10	2000	250	−5	−30	
3N164	TO-72	−2.0	−5.0	−30	400	10	100	300	−3	−30	
3N172	TO-72	−2.0	−5.0	−40	−400	−10	1500	250	−5	−30	Diode Protected
3N173	TO-72	−2.0	−5.0	−30	−10nA	−500		350	−5	−30	
N-Channel:											
2N4351	TO-72	1.0	5.0	25	10nA	10	1000	300	3		
3N170	TO-72	1.0	2.0	25	10nA	10	1000	200	10		
3N171	TO-72	1.5	3.0	25	10nA	10	1000	200	10		
IT1750	TO-72	0.5	3.0	25	10nA	10	3000	50	10	100	Low $r_{DS(ON)}$
M116	TO-72	1.0	5.0	30		100		100			Diode Protected

Low Leakage Diodes

PART NUMBER	PACKAGE	I_R @ 1V (pA) Typ	I_R @ 10V, 125°C (nA) Max	BV_R @ 1μA (V) Min	V_F @ 10mA (V) Min	(V) Max	COMMENTS
ID100	TO-78	0.1	10	30	0.8	1.1	(Note 1)
ID101	TO-71	0.1	10	30	0.8	1.1	(Note 1)

Note 1. Used to protect the inputs of MOSFETs such as 3N163, while maintaining input leakage <0.1pA.

Voltage Controlled Resistors

PART NUMBER	PACKAGE	TYPE	$r_{DS(ON)}$ Min	Max	$V_{GS(OFF)}$ Min	Max	COMMENTS
VCR2N	TO-18	NJFET	20	60	−3.5	−7	(Note 1)
VCR3P	TO-72	PJFET	70	200	3.5	7	(Note 1)
VCR4N	TO-18	NJFET	200	600	−3.5	−7	(Note 1)
VCR5P	TO-72	PJFET	300	900	3.5	7	(Note 1)
VCR7N	TO-72	NJFET	4000	8000	−2.5	−5	(Note 1)
VCR11P	TO-71	NJFET	100	200	−8.0	−12	(Note 2)

Notes:
1. Voltage controlled resistors' source-to-drain resistance is controlled by the gate-to-source voltage. These are intended for use with low level AC signals, such as the input resistor of a voltage controlled variable gain amplifier.
2. Dual channel version, 0.95 to 1 resistance matching.

CMOS EPROMs

ORGANIZATION	MAX ACCESS TIME (ns)	V_{CC} (V)	I_{CC} MAX (mA) OPERATING	I_{CC} MAX (μA) STANDBY	PINS	PACKAGE	TEMP. RANGE
1024×4							
IM6653	550	5	6	140	24	J	I
IM6653M	600	5	6	140	24	J	M
IM6653-1	450	5	6	140	24	J	I
IM6653A	300	10	12	140	24	J	I
IM6653AM	350	10	12	140	24	J	M
512×8							
IM6654	550	5	6	140	24	J	I
IM6654M	600	5	6	140	24	J	M
IM6654-1	450	5	6	140	24	J	I
IM6654A	300	10	12	140	24	J	I
IM6654AM	350	10	12	140	24	J	M

CMOS ROMs

ORGANIZATION	MAX ACCESS TIME (ns)	V_{CC} ()	I_{CC} MAX (mA) OPERATING	I_{CC} MAX (μA) STANDBY	PINS	PACKAGE	TEMP. RANGE
8192×8							
IM63C64	450	5	20		24	J	I
IM63C65	450	5	20	20	24	J	I

Microprocessor Peripherals — See also Display Drivers and Counters, page 8 and 9

PART	DESCRIPTION	f_C (MHz) Max	PINS	PACKAGE	TEMP. RANGE
IM6402	CMOS Industry Standard Compatible UART	1.0	40	P	I
IM6402-1	High-Speed Version of IM6402	2.0	40	P, J	I, M
IM6402A	10V Operating Version of IM6402	4.0	40	P, J	I, M
IM6403	Like Corresponding IM6402	2.46	40	P	I
IM6403-1	Device but with On-board Crystal	3.58	40	P, J	I, M
IM6403A	Oscillator and Divider	6.0	40	P, J	I, M
IM82C43	CMOS I/O Expander for 80C48/49 Microcomputers*		24	P, J	C, I

*Available Fall 1984

Microcontrollers

PART	DESCRIPTION	CLOCK FREQUENCY MHz	PINS
IM80C48	CMOS 8048; 1kbyte ROM; 64 bytes RAM*	6	40
IM80C35	ROMless 80C48; 64 bytes RAM*	6	40
IM80C49	CMOS 8049; 2kbytes ROM; 128 bytes RAM*	6	40
IM80C39	ROMless 80C49; 128 bytes RAM*	6	40

*Available Fall 1984

IGC10000 Series, General Description

The IGC10000 series family of gate arrays provide a practical approach to the development of custom logic circuits. These semi-custom circuits have greatly reduced development costs compared with the "full custom" approach. Design automation helps ensure fast turnaround time and avoids design errors which can cause costly delays in product development schedules.

Technology

The IGC10000 series of gate arrays are fabricated using GE Intersil's high-performance, 4-micron silicon gate CMOS process with a single-layer of metal for interconnect. Wafers are processed in a standard manner, except for two masking steps. Both the metal and contact (via) masks may be customized to obtain the unique logic circuit. Customization of the contact mask, in addition to the metal mask, greatly improves the efficiency of the automatic router. The additional custom mask has minimal impact on turnaround time. A contact mask with a standardized pattern is also available for applications having less stringent routability requirements.

IGC10000 Family of Gate Arrays

PART NUMBER	TOTAL TRANSISTORS	EQUIVALENT 2-INPUT GATES	ARRAY CELLS	I/O CELLS[1]
IGC10408	need	408	272	34
IGC10756	need	756	504	44
IGC11500	need	1500	1000	62

Note:
1. Some analog functions may be performed with I/O cells.

IGC20000 Series, General Description

The IGC20000 Gate Array is a matrix of identical cells, each containing 3 uncommitted CMOS transistor pairs. Large numbers of identical arrays are prefabricated and stockpiled. A particular circuit is constructed from a prefabricated array by specifying the interconnections among the transistors within and between cells on three customizable layers.

Technology

The IGC2000 family of gate arrays are fabricated using GE Intersil's high-performance, selectively oxidized 2-micron channel length and silicon gate CMOS process with double-layer metal interconnect.

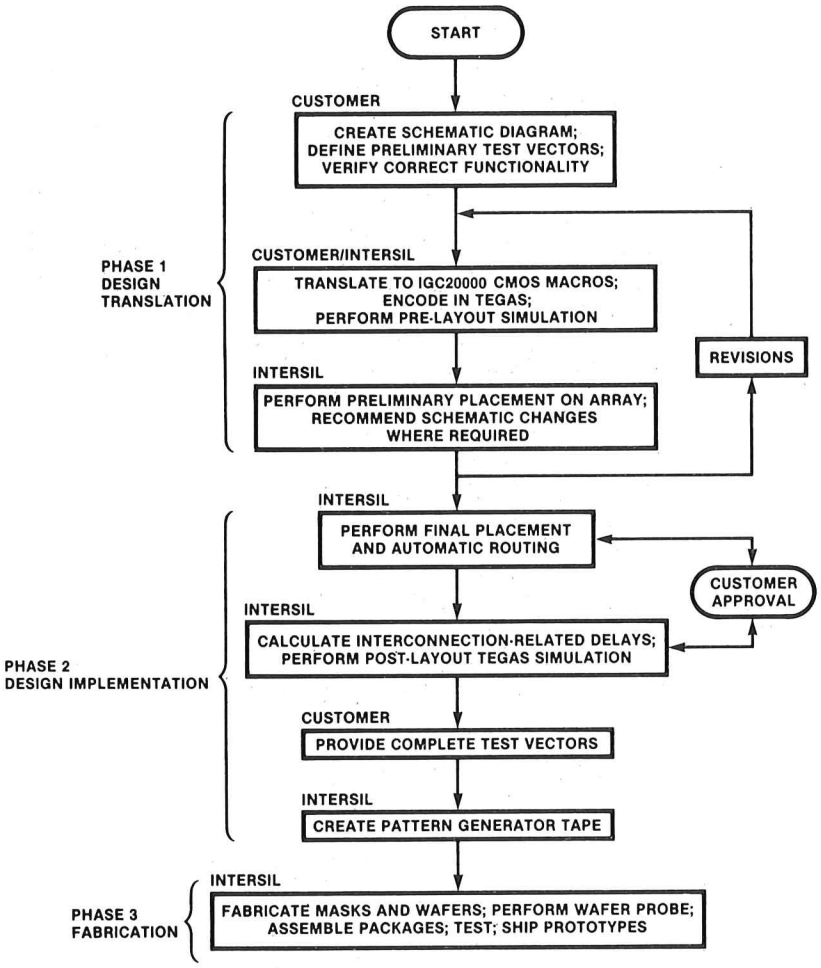
IGC20000 Family of Gate Arrays

PART NUMBER	TOTAL TRANSISTORS	EQUIVALENT 2-INPUT GATES	ANALOG CELLS[1]	BONDING PADS[2]
IGC20030	3008	276	6	40
IGC20120	8092	1155	20	68
IGC20190	12036	1917	28	84
IGC20290	16664	2850	36	100
IGC20450	24304	4480	46	120
IGC20620	32452	6237	56	140
IGC21350	65008	13536	86	200

Notes:
1. Each analog cell is of sufficient complexity to form a complete comparator function.
2. Each bonding pad has an associated I/O cell that includes input, output, and ESD circuits.

IGC10000 and IGC20000 Families of Gate Arrays, Development

An overview of the gate array development process is shown in the flow chart below. This chart delineates the responsibilities of the customer and of Intersil. During Phase 1 (Design Translation), most of the responsibility lies with the customer; during Phase 3 (Fabrication), with Intersil. In Phase 2 (Design Implementation), most of the activities are performed by Intersil, but require customer interaction and approval. For more information, contact either your local Intersil representative or a GE Intersil Sales Office.



Application Note Summary

A003 UNDERSTANDING AND APPLYING THE ANALOG SWITCH
Introduces analog switches and compares them to relays. Describes CMOS, hybrid (FET+driver), JFET "virtual ground" and JFET "positive signal" types. Application information included.

A004 IH5009 LOW COST ANALOG SWITCH SERIES
Compares the members of the IH5009 "virtual ground" analog switches and provides suggested applications.

A005 THE 8007—A HIGH-PERFORMANCE FET INPUT OP AMP
Compares the 8007 with the 741, which is pin compatible and suggests applications such as log-antilog amplifier, sample and hold circuit, photometer, peak detector, etc.

A007 USING THE 8048/8049 MONOLITHIC LOG-ANTILOG AMPLIFIER
Describes in detail the operation of the 8048 log-arithmetic amplifier, and its counterpart, the 8049 antilog amp.

A011 A PRECISION FOUR-QUADRANT MULTIPLIER—THE 8013
Describes, in detail, the operation of the 8013 analog multiplier. Included are multiplication, division, and square root applications.

A013 EVERYTHING YOU ALWAYS WANTED TO KNOW ABOUT THE 8038
This note includes 17 of the most asked questions regarding the use of the 8038.

A016 SELECTING A/D CONVERTERS
Describes the differences between integrating converters and successive approximation converters. Includes a checklist for decision making, and a note on multiplexed data systems.

A017 THE INTEGRATING A/D CONVERTER
Provides an explanation of integrating A/D converters, together with a detailed error analysis.

A018 DO'S AND DONT'S OF APPLYING A/D CONVERTERS
An analysis of proper design techniques using A/D converters.

A020 A COOKBOOK APPROACH TO HIGH-SPEED DATA ACQUISITION AND MICROPROCESSOR INTERFACING
Uses the building block approach to design a complete 12V system. Explains the significance of each component and demonstrates methods for microprocessor interfacing, including the use of control signals.

A021 POWER D/A CONVERTERS USING THE ICH8510
Detailed analysis of the 8510. Included are a section describing the linearity of the device and application notes for driving servo motors, linear and rotary actuators, etc. Also see A026.

A022 A NEW JFET STRUCTURE—THE VARAFET
Describes in detail the operation of the varafet, a standard JFET with the analog gate interfacing components monolithically built-in.

A023 LOW COST DIGITAL PANEL METER DESIGNS
Provides a detailed explanation of the 7106 and 7107 3½ -digit panel meter ICs, and describes two of the evaluation kits available from Intersil.

A026 DC SERVO MOTOR SYSTEMS USING THE ICH8510
This companion note to A021 explains the design techniques utilized in using the ICH8510 family to drive closed loop servo motor systems.

A027 POWER SUPPLY DESIGN USING THE ICL8211 AND ICL8212
Explains the operation of the ICL8211/12 and describes various power supply configurations. Included are positive and negative voltage regulators, constant current source, programmable current source, current limiting, voltage crowbarring, power supply window detector, etc.

A030 THE ICL7104: A BINARY OUTPUT A/D CONVERTER FOR MICROPROCESSORS
Describes in detail the operation of the 7104. Includes digital interfacing, handshake mode, buffer gain, auto-zero and external zero. Appendix includes detailed discussion of auto-zero loop residual errors in dual slope A/D conversion.

A032 UNDERSTANDING THE AUTO-ZERO AND COMMON-MODE PERFORMANCE OF THE ICL7106/7107/7109 FAMILY
Explains in detail the operation of the ICL7106/7/9 family of A/D Converters.

A046 BUILDING A BATTERY OPERATED AUTO RANGING DVM WITH THE ICL7106
Explains principles of auto ranging, problems and solutions. Includes clock circuits, power supply requirements, design hints, schematics, etc.

A047 GAMES PEOPLE PLAY WITH A/D CONVERTERS
Describes 25 different integrating A/D converter applications. Input circuits, conversion modifications, display and microprocessor interfaces are shown in detail.

A050 USING THE IT500 FAMILY TO IMPROVE THE INPUT BIAS CURRENT OF BIFET OP AMPS
A brief description of a preamplifier for BIFET op amps.

A051 PRINCIPLES AND APPLICATIONS OF THE ICL7660 CMOS VOLTAGE CONVERTER
Describes internal operation of the ICL7660. Includes a wide range of possible applications.

A052 TIPS FOR USING SINGLE-CHIP 3½-DIGIT A/D CONVERTERS
Answers frequently asked questions regarding the operation of 3½-digit single-chip A/D converters. Included are sections on power supplies, displays, timing and component selection.

A053 THE ICL7650 A NEW ERA IN GLITCH-FREE CHOPPER STABILIZER AMPLIFIERS
A brief discussion of the internal operation of the ICL7650, followed by an extensive applications section including amplifiers, comparators, logamps, preamps, etc.

A054 DISPLAY DRIVER FAMILY COMBINES CONVENIENCE OF USE WITH MICROPROCESSOR INTERFACEABILITY
Compares and describes the various display drivers. Includes design examples for 7-segment, alphanumeric, and bargraph systems.

MO11 AVOIDING PROBLEMS IN CMOS MEMORY OPERATION
Discusses input overvoltage and SCR latch-up and the multiple address access problem in CMOS RAMs.

Evaluation Kits Available from GE Intersil

GE Intersil offers several of their "system-on-a-chip" ICs in a kit with all components needed to build a complete operating system — counters, display drivers, digital voltmeters, etc. These kits include the GE Intersil IC, other passive and active components, and in most cases, a printed circuit board.

By using one of these "Evaluation Kits" you can easily evaluate these unique ICs without the extra effort and delay caused by first having to locate and purchase each of the additional components, and then having to wire a breadboard. With the help of a GE Intersil Evaluation Kit, an engineer or technician can have the system "up and running" in about half an hour.

PRODUCT DESCRIPTION	PART NUMBER	CONTENTS
Power Amplifiers		
Power Amplifier Kits	ICH8510IEV/KIT	ICH8510I+Socket+Heatsink
	ICH8510MEV/KIT	ICH8510M+Socket+Heatsink
	ICH8520IEV/KIT	ICH8520I+Socket+Heatsink
	ICH8520MEV/KIT	ICH8520M+Socket+Heatsink
	ICH8530IEV/KIT	ICH8530I+Socket+Heatsink
	ICH8530MEV/KIT	ICH8530M+Socket+Heatsink
Panel Meters		
3½-Digit LCD Panel Meter Kit	ICL7106EV/KIT	ICL7106+PC Card+All Passive Components
3½-Digit LED Panel Meter Kit	ICL7107EV/KIT	ICL7107+PC Card+All Passive Components
3½-Digit Low Power LCD Panel Meter Kit	ICL7136EV/KIT	ICL7136+PC Card+All Passive Components
4½-Digit A/D Converter Kit	ICL7135EV/KIT	ICL7135+ICL7660+ICL8069+PC Card+Active, Passive Components
Display Drivers		
4½-Digit LCD Display Driver Kit	ICM7211EV/KIT	ICM7211+4½-Digit LCD Display+PC Card+Active, Passive Components
4½-Digit LED Display Driver Kit	ICM7212EV/KIT	ICM7212+4½-Digit LED Display+PC Card+Active, Passive Components
4½-Digit VF Display Driver Kit	ICM7235EV/KIT	ICM7235+4½-Digit VF Display+PC Card+Active, Passive Components
8-Character Multiplexed LCD Display Driver Kit	ICM7233EV/KIT	2 of ICM7233+PC Card+8-Character Triplexed LCD Display
8-Character Multiplexed LED Display Driver Kit	ICM7243EV/KIT	ICM7243+PC Card+8-Character LED
Counters		
4½-Digit LCD Display Counter Kit	ICM7224EV/KIT	ICM7224+ICM7207A+5.24288MHz Crystal+4½-Digit LCD Display+PC Card+Passive Components
4½-Digit LED Display Counter Kit	ICM7225EV/KIT	ICM7225+ICM7207A+5.24288MHz Crystal+4½-Digit LED Display+PC Card+Passive Components
4½-Digit VF Display Counter Kit	ICM7236EV/KIT	ICM7236+ICM7207A+5.24288MHz Crystal+4½-Digit VF Display+PC Card+Passive Components
Stopwatches		
8-Digit, 4 Function/24 Hour Clock	ICM7045EV/KIT	ICM7045+6.5536MHz Crystal
6-Digit, 4 Function	ICM7215EV/KIT	ICM7215+3.2768MHz Crystal
Touchtone® Encoder		
One contact per key	ICM7206EV/KIT	ICM7206+3.579545MHz Crystal
Two contacts per key, common to positive supply	ICM7206AEV/KIT	ICM7206A+3.579545MHz Crystal
Common to negative supply, oscillator enabled when key depressed	ICM7206BEV/KIT	ICM7206B+3.579545MHz Crystal
8-Digit Frequency/Period Counter		
5 Function	ICM7226AEV/KIT	ICM7226A+10MHz Crystal+PC Card+LEDs+All Passive Components
Oscillator Controller		
For application as frequency counter with ICM7208, 7217, 7224, 7225, or 7236	ICM7207EV/KIT	ICM7207+6.5536MHz Crystal
	ICM7207AEV/KIT	ICM7207A+5.24288MHz Crystal

Package Information

Examples of Intersil Part Numbers

BASIC	ELECTRICAL OPTION	TEMP	PKG	PIN	ORDER #
ICH8500	A	C	T	V	ICH8500ACTV
ICL8038	C	C	P	D	ICL8038CCPD
IH5040		M	D	E	IH5040MDE

ON ALL INTERSIL IC PART NUMBERS. THE LAST THREE LETTERS ARE TEMPERATURE, PACKAGE, AND NUMBER OF PINS, RESPECTIVELY.

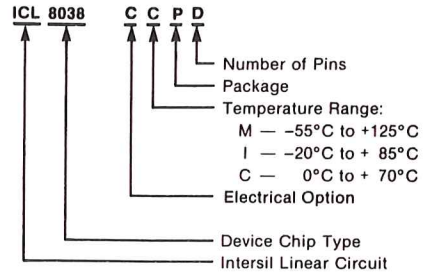
PACKAGE:

A	TO-237
B	Plastic flat-pack
C	TO-220
D	Ceramic dual-in-line
E	Small TO-8
F	Ceramic flat-pack
H	TO-66
I	16 pin (.6 x .7 pin spacing) hermetic hybrid dip
J	Cerdip dual-in-line
K	TO-3
L	Leadless, ceramic
P	Plastic dual-in-line
S	TO-52
T	TO-5 type (also TO-78, TO-99, TO-100)
U	TO-72 type (also TO-18, TO-71)
V	TO-39
Z	TO-92
/W	Wafer
/D	Dice

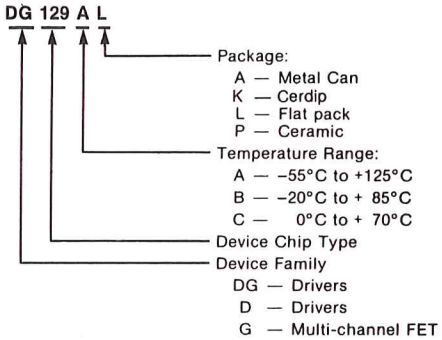
NUMBER OF PINS:

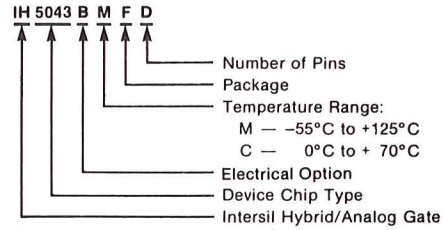
A	8	P	20
B	10	Q	2
C	12	R	3
D	14	S	4
E	16	T	6
F	22	U	7
G	24	V	8 (0.200" pin circle, isolated case)
H	42		
I	28	W	10 (0.230" pin circle, isolated case)
J	32		
K	35	Y	8 (0.200" pin circle, case to pin 4)
L	40		
M	48	Z	10 (0.230" pin circle, case to pin 5)
N	18		

LINEAR:

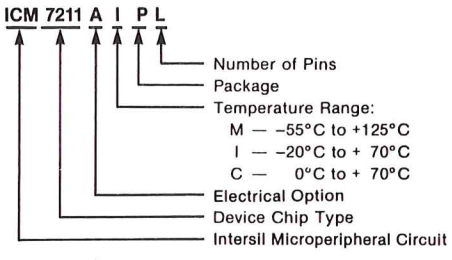


HYBRIDS:

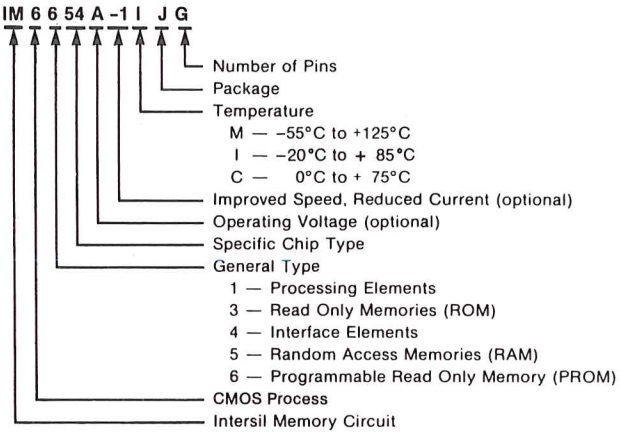




MICROPERIPHERALS



CMOS MEMORY



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Voltage Regulator, Positive 7
Waveform Generator, Sine, Square, Triangle 6

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